UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/826,367	04/19/2004	Satoshi Aoyama	119491	1038

25944 7590 09/27/2007

OLIFF & BERRIDGE, PLC
P.O. BOX 19928
ALEXANDRIA, VA 22320

EXAMINER	
WANG, EUGENIA	
ART UNIT	PAPER NUMBER
1745	

MAIL DATE	DELIVERY MODE
09/27/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/826,367	AOYAMA ET AL.	
	Examiner	Art Unit	
	Eugenia Wang	1745	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *20 August 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-29* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-29* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. In response to the amendment received August 20, 007:

a. Claims 1-29 are pending.

b. The previous claim objections have been withdrawn in light of the amendment.

c. The previous 112 rejections have been withdrawn in light of the amendment.

d. The core of the rejection is maintained, with slight changes made as necessitated by the amendment. Thus the action is final.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1-7 and 10-13 are rejected under 35 U.S.C. 102(b) as being anticipated by US 2003/0056440 (Aoyama et al.).

As to claim 1, Aoyama et al. teach a power system (see fig. 1). The power system includes fuel cell [70], a fuel gas generation system (vaporizer [20], mixer [30], reformer [40], hydrogen separator [60]). The hydrogen line is supplied to the fuel cell via inlet [71]. Furthermore, there is a purge system for the hydrogen separator, which is operated using pump [74]. Pump [74] is connected to a control unit [10]. The controller

is also connected to the raw material line via valve [31], and thus has the capability to receive a stop signal for supplying hydrogen to the fuel cell and to activate a purge mode to purge gas or a no-purge mode to merely stop the hydrogen flow.

It has been held that the recitation of an element is "capable" of performing a function is not a positive limitation but only requires the ability to so perform. It does not constitute a limitation in any patentable sense. *In re Hutchinson,* 69 USPQ 138.

While intended use recitations and other types of functional language cannot be entirely disregarded. However, in apparatus, article, and composition claims, intended use must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. In a claim drawn to a process of making, the intended use must result in a manipulative difference as compared to the prior art. In re Casey, 370 F.2d 576, 152 USPQ 235 (CCPA 1967); In re Otto, 312 F.2d 937, 938, 136 USPQ 458, 459 (CCPA 1963).

Claims directed to apparatus must be distinguished from the prior art in terms of structure rather than function. In re Danly, 263 F.2d 844, 847, 120 USPQ 528, 531 (CCPA 1959). See also MPEP § 2114.

The manner of operating the device does not differentiate an apparatus claim from the prior art. A claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural

limitations of the claim. Ex parte Masham, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987).

As to claim 2, Aoyama et al. inputs many parameters that would indicate the working state of the power system, for example the temperature sensor [64] on the hydrogen separator [60] (fig. 1). Since they are both connected to the controller, the controller is capable of selecting the hydrogen purge or hydrogen-no purge based on this parameter. (See rejection of claim 1 for Office's position on "capable" of for an apparatus.)

As to claims 3, 10, and 11, the structure of Aoyama et al. in fig. 1 is capable of performing the function of the claims using controller [10] and its connections. (See rejection of claim 1 for Office's position on "capable" of for an apparatus.)

As to claim 4, Aoyama et al. inputs many parameters that would indicate the working state of the power system, for example the temperature sensor [64] on the hydrogen separator [60] (fig. 1). Since they are both connected to the controller, the controller is capable of switching to hydrogen purge or hydrogen-no purge based on this parameter. (See rejection of claim 1 for Office's position on "capable" of for an apparatus.)

As to claims 5 and 6, controller [10] measures the temperature of the hydrogen separating portion [60] via sensor [64], and the controller is capable of switching from hydrogen purge to hydrogen no-purge mode based on a preset level of a temperature. (See rejection of claim 1 for Office's position on "capable" of for an apparatus.)

As to claim 7, the system of Aoyama et al. has a booster mechanism that boosts the pressure of a hydrogen in the hydrogen supply line. This is done using raw material valve [31] (closing the valve reduces pressure, and opening it increases pressure to the mixer, which would effect the anode inlet pressure). Since the valve is connected to the controller [10], the system controls the booster mechanism.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to

consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

3. Claims 8, 9, 12, and 13 rejected under 35 U.S.C. 103(a) as being unpatentable over Aoyama et al.

The teachings of Aoyama et al. have been previously taught and are herein incorporated.

As to claim 8, Aoyama et al. teach a heat exchanger [50] that is adjacent to the hydrogen separator [60] (fig. 1). Aoyama does not provide a connection for operation of the heat exchanger to the control unit, so that the stop control module (controller [1]) controls the heat exchanger to keep the temperature of the hydrogen separation module in the no-purge mode. The motivation for providing a heat exchanger to the hydrogen separation module during the no purge mode is that the hydrogen separator membrane has a tendency of becoming fragile or brittle during low temperature absorbing (para 0006, lines 1-4). Therefore it would have been obvious to one having ordinary skill in the art at the time the claimed invention was made to provide a heat exchanger adjacent to keep the hydrogen separator at a certain temperature during the no-purge mode in order to prevent the separator membrane from becoming brittle.

As to claim 9, the obviated structure of Aoyama et al. is capable of providing the function of claim 9. (See rejection of claim 1 for Office's position on "capable" of for an apparatus.)

As to claim 12, Aoyama et al.'s teaching in fig. 1 has a controller that regulates the supply of material to the chemical reaction module via raw material valve [31] and

air valve [32]. Aoyama et al.'s structure with the controller receives restart request, and the connection of the controller would be capable of supplying a greater amount of material to the chemical reaction module in response to input of a restart request after the stop control in the hydrogen purge mode.

Aoyama et al. does not teach that the control unit is connected to the fuel cell and checks the output demand to the fuel cell. However there is motivation for judging how much raw material should be supplied in order to meet the demand. Therefore it would have been obvious to one having ordinary skill in the art at the time the claimed invention was made to provide a controller to check the fuel demand of the fuel cells in order not to oversupply or undersupply the fuel cell with the reactant.

As to claim 13, Aoyama's obviated system of claim 12 would have the capability to provide the functionality of controlling supply based off of output demand. (See rejection of claim 1 for Office's position on "capable" of for an apparatus.)

4. Claims 17-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Aoyama et al, (as applied to claims 1, 2, 3, 8, 10, and 12) in view of US 2001/0016276 (Yamanashi).

As to claim 17, 19, and 24-28, Aoyama et al. do not teach that the fuel cell is used in the motor driving source in a mobile object.

Yamanashi teach a fuel cell used in a vehicle (abs). As seen in fig. 1, the fuel cell that is connected to the drive motor via fuel cell control unit [23] and vehicle control unit [24]. The motivation for using the system of Aoyama et al. in a vehicle, where the fuel cell is connect to the drive motor, is that it a source of more environmentally friendly

energy, as compared to conventional fuels. Therefore it would have been obvious to one having ordinary skill in the art at the time the claimed invention was made to use the fuel cell system of Aoyama et al. in the car system of Yamanashi to provide a cleaner option of providing power to a car.

As to claim 18, Yamanashi's motor inherently has an on-off state start switch, as is evidenced by the presence of the vehicle control until [24] (fig. 1). The combined fuel cell and control unit of Aoyama et al. in the system of Yamanashi would be capable of stopping the hydrogen purge mode when the starter switch is off, since the fuel cell control unit and vehicle control unit are connected. (See rejection of claim 1 for Office's position on "capable" of for an apparatus.)

As to claim 20, the combined control system of Aoyama et al. (with respect to the fuel cell) in tandem with that of Yamanashi (the connection of the vehicle control unit, which is connected to the fuel cell control unit), would have the capability of manipulating the moving of the mobile object and of restarting the fuel gas generation system upon input operation of allowing movement during the purge mode. (See rejection of claim 1 for Office's position on "capable" of for an apparatus.)

As to claim 21, the combined control system of Aoyama et al. (with respect to the fuel cell) in tandem with that of Yamanashi (the connection of the vehicle control unit, which is connected to the fuel cell control unit) has been previously obviated. The vehicle shown in fig. 1 of Yamanashi has vehicle speed sensor connected to vehicle control unit as well. Therefore the combined structure of Yamanashi and Aoyama et al. would have the capability of restarting the fuel gas generation system with respect to a

preset moving speed in the hydrogen no purge mode. (See rejection of claim 1 for Office's position on "capable" of for an apparatus.)

As to claims 22 and 23, Aoyama et al. is capable of receiving a restart request via controller [10]. (See rejection of claim 1 for Office's position on "capable" of for an apparatus.) The use of Aoyama et al.'s fuel cell in the use of vehicle has been obviated with Yamanashi. Aoyama et al. further teaches the temperature monitoring of the hydrogen separating portion [60] via sensor [64]. Aoyama et al. also teach a heat exchanger [50] that is adjacent to the hydrogen separator [60] (fig. 1).

Aoyama does not provide a connection for operation of the heat exchanger to the control unit, so that it can be used to warm the fuel gas generation system in response to a restart request when the observed temperature is not higher than a preset lower limit while in the hydrogen purge mode. The motivation for providing heat to the hydrogen separation module is that the hydrogen separator membrane has a tendency of becoming fragile or brittle during low temperature absorbing (para 0006, lines 1-4). Therefore it would have been obvious to one having ordinary skill in the art at the time the claimed invention was made to provide a heat exchanger adjacent to keep the hydrogen separator at a certain temperature during the purge mode in order to prevent the separator membrane from becoming brittle.

5. Claims 14-16 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Aoyama et al. (as applied to claim 1) in view of US 6063515 (Epp et al.).

As to claim 14, Aoyama et al. does not provide a secondary battery to the fuel cell system with a power supply control module that controls the supply of electric power fro the secondary battery.

Epp et al. teach the use of a secondary battery [306] for supplementing the power generated by the fuel cell (col. 11, lines 8-12). As Epp et al.'s system says that the power of the battery is only used when the fuel cell generated power is not enough, a sort of determination control is inherently applied to the load, fuel cell, and battery to determine if the battery power is needed.

The motivation for providing a secondary battery to the teaching of Aoyama et al. is to ensure that the load will still work even if the fuel cell does not provide enough electricity to it. Therefore it would have been obvious to one having ordinary skill in the art at the time the claimed invention was made combine a secondary battery with a fuel cell in order to guarantee that the load has enough power to run on.

As to claim 15, the battery in Epp et al.'s system inherently has an output demand input module that receives an output demand to the power system, wherein in response to the output demand of not greater than a preset level, the power control module controls the secondary battery to output electric power. The support for this is stated within Epp et al.'s use for the battery – the fact that it is only employed when the demand of electrical load [360] exceeds the output of the fuel cell stack [305] (col. 11, lines 8-12). As it talks about the demand of load [360] and output of fuel cell stack [305], it inherently has an output demand and input module. Furthermore, inherent

control module has been previously established of being capable of executing the stop control in the hydrogen no-purge mode.

As to claim 16, Epp et al. does not teach that the secondary battery has a state of charge measurement module, wherein the stop control module executes the stop control of the hydrogen purge mode when the observed state of charge is not higher than that of a preset level.

However, there is motivation for providing the state-of-charge measurement module. The motivation for providing such a module on the secondary battery is to ensure that the load (in this case the submarine) has enough power to sustain the load. Therefore it would have been obvious to one having ordinary skill in the art at the time the claimed invention was made to include the state-of-change measurement module on the battery in order to provide the user of the load with a warning about battery replacement in order to ensure that the load will function. (There is motivation for applying a control system to the stop controller to purge when the state of charge is not higher than a certain value; it is in order to ensure proper shut down of the fuel cell system. Not only is this function obviated, but the system of Epp et al. would be capable of being programmed for such a function with the obviated state-of-charge measurement module on the secondary battery.)

As to claims 29, Aoyama et al. does not teach that the fuel cell is used in a mobile object, namely for the motive drive force.

Epp et al. teaches that the fuel cell system is used in submarines (as indicated by the title), but it does not specifically mention that power generated by their fuel cell

system is used to power the motor of a mobile object. However, since the fuel cell system is applied to a submarine, the power generated is capable of being used for motor.

6. Claims 1-6, 10-13, 17, 18, 24, 27, and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 2003/0072978 (Meyer et al.) in view of Epp et al., as evidenced by US 6410175 (Tillmetz et al.).

As to claim 1, Meyer et al. teach a fuel cell system. The fuel cell system has a fuel processing system [104], where fuel processing system includes an autothermal reformer [134] (para 0017, lines 1-3). The autothermal reformer [134] takes fuel, air, and steam and converts it to hydrogen, carbon dioxide, and carbon monoxide (para 0018, lines 1-3). Therefore, the autothermal reformer acts as the chemical reaction module. The hydrogen, carbon dioxide, and carbon monoxide is further fed through a shift converter and selective oxidizer (which rids the gaseous product of CO_2) before being provided to the anode [124] of the fuel cell (figure). Although a stop input module and stop control module is not specifically mentioned in Meyer et al.'s system, one inherently exist. This is exemplified by the fact that it talks about a shutdown system and the controlling of a switch [132], valves [141, 152, 154, 156], and blowers [116B, 116C]. In further accordance with Meyer et al.'s shutdown process, diverter valves [140, 149] are opened, which results in purging both sides of both sides of the fuel cell as well as the fuel processing system [104] of residual hydrogen and carbon monoxide (para 0025; para 0026, lines 1-4). Although not specifically mentioned, Meyer et al.'s system is inherently stops with an initial no-purge mode, as some time inherently

passes between stopping and shutdown mode. Additionally, it is capable of programmed to stop with the no-purge mode in addition to the purge mode as described above, what with the inherency of the controller due to the sensors and valves present.

It has been held that the recitation of an element is "capable" of performing a function is not a positive limitation but only requires the ability to so perform. It does not constitute a limitation in any patentable sense. *In re Hutchinson,* 69 USPQ 138.

While intended use recitations and other types of functional language cannot be entirely disregarded. However, in apparatus, article, and composition claims, intended use must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. In a claim drawn to a process of making, the intended use must result in a manipulative difference as compared to the prior art. In re Casey, 370 F.2d 576, 152 USPQ 235 (CCPA 1967); In re Otto, 312 F.2d 937, 938, 136 USPQ 458, 459 (CCPA 1963).

Claims directed to apparatus must be distinguished from the prior art in terms of structure rather than function. In re Danly, 263 F.2d 844, 847, 120 USPQ 528, 531 (CCPA 1959). See also MPEP § 2114.

The manner of operating the device does not differentiate an apparatus claim from the prior art. A claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural

limitations of the claim. Ex parte Masham, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987).

Meyer et al. does not teach a hydrogen separation module within a fuel processing module. However Epp et al. teach a hydrogen separator after the reformer section. It would have been obvious to replace the shift converter and selective oxidizer, with Epp's hydrogen separate also serves the purpose of removing carbon dioxide from the hydrogen (col. 4, lines 8-14)) in order to purify the hydrogen fuel before it is fed into the fuel cell. This change is evidenced by the fact that Tillmetz et al. equates the shift converters, selective oxidizers, and hydrogen separators as having the same function in a fuel processing subsystem (col. 2, lines 10-20). (Providing the hydrogen purification system in the Meyer et al. fuel cell system would also provide the hydrogen cause the stop signal input module, purge gas supply module, and stop control module to it as well.)

As to claim 2, Meyer et al.'s system has an input module inputting a predetermined parameter (startup/shutdown), where the stop control module (startup and shutdown inherently done by the previously established controller), which selects either the hydrogen purge or hydrogen no-purge mode, as the stop control mode is based on that input parameter and executes the stop control in the selected stop control mode. (See rejection of claim 1 for the Office's position on "capable" of for an apparatus claim.)

As to claim 3, the control module that inherent exists in Meyer et al.'s system has already been established. Therefore it (acting as the stop control module) would be

capable of changing over the stop control mode to the hydrogen purge mode (shutdown) after execution of the stop control in the hydrogen no-purge mode (startup). (See rejection of claim 1 for the Office's position on "capable" of for an apparatus claim.)

As to claim 4, the inherent controller of Meyer et al.'s system is capable of acting as a parameter input module that inputs a predetermined parameter (shutdown/startup) representing a working state of at least on of the power system and a system with the power system mounted thereon, wherein the stop control module switches over to the stop control from the hydrogen no-purge mode to the hydrogen purge mode, when the input parameter fulfils a preset condition. (See rejection of claim 1 for the Office's position on "capable" of for an apparatus claim.)

As to claims 5 and 6, Meyer et al. teaches that during startup the fuel cell that the anode is initially purged (para 0027). This is continued until the reformer [143] and the shift converter [136] (replaced with hydrogen separator) is approximately 250°C.

Meyer et al. does not, however, teach to purge the to purge the fuel processing system until the temperature at the reformer [134] shift converter [136] is 250°C. However, the motivation for purging the fuel processing system as well is to cleanse the system of any contaminants that could have gathered during the off time, so they would not be provided to the fuel cell once normal function of the fuel cell and fuel processor commenced. Another motivation would be to aid in the warm-up process. Therefore it would have been obvious to one having ordinary skill in the art at the time the claimed invention was made to purge the fuel processor when the shift converter is at a lower

temperature than the preset level in order to cleanse the contaminants from the system as well as to aid in the warm-up process.

As to claim 10, Meyer et al. teaches a startup mode (no purge). This actuates the purge gas supply (as the mode switches from shutdown (purge) to startup (no purge)), where actuating is just seen as any movement within the purge valve.

As to claim 11, Meyer et al.'s system inherently actuates the purge gas supply module after a certain time period has elapsed since the actuation of the gas supply module in the hydrogen no-purge mode. This time period elapsed is taken to be that of lag time between two modes (startup/normal/shutdown).

As to claim 12, Meyer et al. teaches a start-up fuel cell procedure (the "restart request input") (para 0027-0029). This start-up procedure is controlled by the inherently present but not shown control system (as established earlier) and would be capable of requesting a demand output, as it is connected to the load and thus can read the load demand. Furthermore, it is capable of regulating the amount of material supplied to the fuel processing system due to a restart request via valves [146, 154, 152] and blower [116C] such that the amount supplied is more than that of the normal state. (See rejection of claim 1 for the Office's position on "capable" of for an apparatus claim.)

As to claim 13, Meyer et al.'s system would be capable of changing the material supplied to the fuel processing section [104], and thus with its inherent controller would be capable of supplying a greater amount of material to the fuel processing system than normal supply in the state of normal operations when output demand is not greater than

a preset level after a start of the stop control in the hydrogen purge mode. (See rejection of claim 1 for the Office's position on "capable" of for an apparatus claim.)

As to claims 17, 24, 27, and 28, Meyer et al. does not teach that the power generated by their fuel cell system is used to power the motor of a mobile object.

However, the similar system of Epp et al. recites the use of its fuel cell system for a submarine, which is a mobile system with a motor. (Although not specifically mentioned that the motor is drawing power from the fuel cell, the fuel cell is capable of providing power for the motor system.) The motivation for using a fuel cell in a mobile system, namely the motor, would be to use an environmentally friend source of electricity needed to run the motor (as opposed to traditional fuels). Therefore it would have been obvious to one having ordinary skill in the art at the time the claimed invention was made to use a widely known, more environmentally friend form of electricity to run a mobile device, namely the motor.

As to claim 18, the Meyer et al.'s system has been obviated to be used in a mobile object, as seen above. However, Meyer et al.'s system does not teach that the predetermined parameter includes a parameter representing an on-off state of a starter switch on the motor, where the stop control module executes the stop control it the hydrogen purge mode when the starter witch is off. The motivation for providing such a control within a vehicle system is that the fuel cell does not generate power (for the motor) during the shutdown system, and so by corroborating the (lack of) power demand with the off position of the starter switch will prevent the fuel cell from providing power after the motor is no longer engaged. Therefore it would have been obvious to

one having ordinary skill in the art at the time the claimed invention was made to combine a parameter for the on-off state of the starter switch of the motor (startup/shutdown) with the stop control module in order to keep the fuel cell from generating unnecessary power.

7. Claims 8, 9, and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Meyer et al. in view of Epp et al. as evidenced by Tillmetz et al. (as applied to claim 1), in further view of Aoyama et al.

As to claim 8, the combination of Meyer et al., Epp et al., and Tillmetz et al. does not teach a temperature retention module that keeps temperature in the hydrogen separation module, wherein the stop control module controls the temperature retention module to keep the temperature in the hydrogen separation module during the hydrogen no-purge mode.

Aoyama et al. teach a heat exchanger [50] that is adjacent to the hydrogen separator [60]. The motivation for providing a heat exchanger to the hydrogen separation module during the no purge mode is that the hydrogen separator membrane has a tendency of becoming fragile or brittle during low temperature absorbing (para 0006, lines 1-4). (The time that the most hydrogen would be absorbed would be during the no-purge time rather than the purging time.) Therefore it would have been obvious to one having ordinary skill in the art at the time the claimed invention was made to provide a heat exchanger adjacent to keep the hydrogen separator at a certain temperature in order to prevent the separator membrane from becoming brittle.

As to claim 9, the combination of Meyer et al., Epp et al., and Tillmetz et al., and Aoyama et al. does not teach stopping the operation of the temperature retention module via a stop control module, when stop control in the hydrogen no-purge mode continues for at least a present time period. However, this function would be obviated with the combined structure of Epp et al., and Tillmetz et al., and Aoyama et al.. This is because after startup (no purge) the fuel provided to the reformer and subsequently the hydrogen separator comes from burner [110], which maintains the temperature of the hydrogen that is provided to the hydrogen separator. The motivation for discontinuing the use of the heat exchanger on the hydrogen separator after a period of time is to conserve the energy that the heat exchanger would use. Therefore it would have been obvious to one having ordinary skill in the art at the time the claimed invention was made to apply time constraints to operation of the heat exchanger in order to save energy.

As to claim 26 Meyer et al. does not teach does not teach that the power generated by their fuel cell system is used to power the motor of a mobile object.

However, the similar system of Epp et al. recites the use of its fuel cell system for a submarine, which is a mobile system with a motor. (Although not specifically mentioned that the motor is drawing power from the fuel cell, the fuel cell is capable of providing power for the motor system.) The motivation for using a fuel cell in a mobile system, namely the motor, would be to use an environmentally friend source of electricity needed to run the motor (as opposed to traditional fuels). Therefore it would have been obvious to one having ordinary skill in the art at the time the claimed

invention was made to use a widely known, more environmentally friend form of electricity to run a mobile device, namely the motor.

8. Claims 1, 7, 14-16, 19, 20, 23, 25, and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Epp et al. in view of Meyer et al.

As to claim 1, Epp et al. teaches a power system with a fuel gas generation system [301] with a vaporizer [312] and a reformer [313] and hydrogen separator [302], where the hydrogen fuel is delivered to the fuel cell via inlet [380] (fig. 3). Epp et al. does not teach a shut down system, however, a fuel cell that operates inherently has a startup and shutdown mode, wherein the shutdown mode inherently stops the supply of the reactants to the fuel cells. This signal is accomplished by a control system for the system, which is inherent but not shown in fig. 3. The indication of the presence of a control system is the fact that valves [359, 391] and sensors [361, 363] are in the system and must provide information to a controller to be controlled by said controller.

However Epp et al. does not teach a purge gas supply module that supplies specified purge gas for the removal of hydrogen from eh hydrogen separation module. Meyer et al. teach a fuel cell system with a fuel processing system [104], similar to that of Epp et al.'s system. However Meyer et al.'s system provides a shutdown process, which purges the fuel processing system [104] of the residual hydrogen (para 0026, lines 1-3). The motivation for combining the purge system of Meyer et al. with Epp et al.'s system is to cut back on reactant damage to the fuel processing system (which the is vaporizer [312], reformer [313], and hydrogen separator [302] in Epp et al.'s system) and to avoid the possibility of combustion in the instance that the fuel processing

system does not react 100% and fuel is present within the fuel processing system. Therefore it would have been obvious to one having ordinary skill in the art at the time the claimed invention was made to apply Meyer et al.'s purge system to Epp et al.'s system in order to cut down on reactant damage to the fuel processing system and in order to cut down on the change of accidental combustion.

The obviated structure of Epp et al. with Meyer et al.'s pure system would then be capable of having a stop control module (present with the inherent control system) which has a hydrogen purge mode and hydrogen no-purge mode, where leftover hydrogen is purged and where hydrogen is not delivered to the fuel cells, respectively.

It has been held that the recitation of an element is "capable" of performing a function is not a positive limitation but only requires the ability to so perform. It does not constitute a limitation in any patentable sense. *In re Hutchinson,* 69 USPQ 138.

While intended use recitations and other types of functional language cannot be entirely disregarded. However, in apparatus, article, and composition claims, intended use must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. In a claim drawn to a process of making, the intended use must result in a manipulative difference as compared to the prior art. In re Casey, 370 F.2d 576, 152 USPQ 235 (CCPA 1967); In re Otto, 312 F.2d 937, 938, 136 USPQ 458, 459 (CCPA 1963).

Claims directed to apparatus must be distinguished from the prior art in terms of structure rather than function. In re Danly, 263 F.2d 844, 847, 120 USPQ 528, 531 (CCPA 1959). See also MPEP § 2114.

The manner of operating the device does not differentiate an apparatus claim from the prior art. A claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural limitations of the claim. Ex parte Masham, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987).

As to claim 7, Epp et al.'s system has compressor [372] between the fuel inlet [380] and the hydrogen separator [302] (fig. 3).

However, Epp et al. does not teach the stop control module to control the compressor (booster mechanism) to boost the pressure of hydrogen in the hydrogen supply line in the no-purge mode. However, Meyer et al.'s system mentions startup (no-purge mode) and shutdown (purge) (para 0023-0029). The motivation for combining this control on Epp et al.'s system would be to provide more hydrogen to the fuel cell during start up in order to bring it to full power. Therefore it would have been obvious to one having ordinary skill in the art at the time the claimed invention was made to implement the startup and shutdown functions of Meyer et al. in conjunction with the compressor of Epp et al. in order to provide a quicker startup for the fuel cell.

As to claim 14, Epp et al. teach the use of a secondary battery [306] for supplementing the power generated by the fuel cell (col. 11, lines 8-12). As Epp et al.'s

system says that the power of the battery is only used when the fuel cell generated power is not enough, a sort of determination control is inherently applied to the load, fuel cell, and battery to determine if the battery power is needed. Because some sort of control is applied to it Epp et al.'s system is capable of controlling the supply of electric power from the secondary battery according to a state of the stop control of the fuel cells. (See rejection of claim 1 for the Office's position on "capable" of for an apparatus claim.)

As to claim 15, the battery in Epp et al.'s system inherently has an output demand input module that receives an output demand to the power system, wherein in response to the output demand of not greater than a preset level, the power control module controls the secondary battery to output electric power. The support for this is stated within Epp et al.'s use for the battery – the fact that it is only employed when the demand of electrical load [360] exceeds the output of the fuel cell stack [305] (col. 11, lines 8-12). As it talks about the demand of load [360] and output of fuel cell stack [305], it inherently has an output demand and input module. Furthermore, inherent control module has been previously established of being capable of executing the stop control in the hydrogen no-purge mode.

As to claim 16, Epp et al. does not teach that the secondary battery has a state of charge measurement module, wherein the stop control module executes the stop control of the hydrogen purge mode when the observed state of charge is not higher than that of a preset level.

However, there is motivation for providing the state-of-charge measurement module. The motivation for providing such a module on the secondary battery is to ensure that the load (in this case the submarine) has enough power to sustain the load. Therefore it would have been obvious to one having ordinary skill in the art at the time the claimed invention was made to include the state-of-change measurement module on the battery in order to provide the user of the load with a warning about battery replacement in order to ensure that the load will function. (There is motivation for applying a control system to the stop controller to purge when the state of charge is not higher than a certain value; it is in order to ensure proper shut down of the fuel cell system. Not only is this function obviated, but the system of Epp et al. would be capable of being programmed for such a function with the obviated state-of-charge measurement module on the secondary battery.)

As to claim 19, Epp et al.'s fuel cell system is used in submarines (as indicated by the title), which is a mobile object that has a motor as the driving source. Although it is specifically mentioned that the motor is drawing power from the fuel cell, the fuel cell is capable of providing power for the motor system. (See rejection of claim 1 for the Office's position on "capable" of for an apparatus claim.)

As to claim 20, the combination of Epp et al.'s mobile object (a submarine) and Meyer et al.'s startup/shutdown system provide a restart control module that restarts the fuel gas generation system (the end of the startup mode) (para 0028). This thus provides power to the mobile object, allowing it to move (as the use of fuel cell power in

the motor has been previously obviated). As the startup mode follows a shutdown mode, it inherently restarts from a purge mode setting.

As to claim 23, the previously obviated fuel cell/submarine combination of Epp et al. and the startup/shutdown process of Meyer et al. is applied. Meyer et al. teaches that during startup the fuel cell that the anode is initially purged (para 0027). This is continued until the reformer [143] and the shift converter [136] (replaced with hydrogen separator) is approximately 250°C.

Meyer et al. does not, however, teach to purge the to purge the fuel processing system until the temperature at the reformer [134] shift converter [136] is 250°C. However, the motivation for purging the fuel processing system as well is to cleanse the system of any contaminants that could have gathered during the off time, so they would not be provided to the fuel cell once normal function of the fuel cell and fuel processor commenced. Furthermore, the flow of purge gases would aid in the warm-up process. Therefore it would have been obvious to one having ordinary skill in the art at the time the claimed invention was made to purge the fuel processor when the shift converter is at a lower temperature than the preset level in order to purify and to warm the system up.

As to claims 25 and 29, Epp et al. teaches that the fuel cell system is used in submarines (as indicated by the title), but it does not specifically mention that power generated by their fuel cell system is used to power the motor of a mobile object. However, since the fuel cell system is applied to a submarine, the power generated is capable of being used for motor.

9. Claims 21 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Epp et al. in view of Meyer et al. (as applied to claims 1 and 19) in further view of US 2001/0016276 (Yamanashi).

As to claim 21, the mobile object (submarine) of Epp et al. inherently has a speed controller.

However, Epp et al. does not teach that the moving speed measurement module measures the speed and that the restart control module restarts the fuel gas generation systems when the observed moving speed exceeds a present level in the purge mode.

Yamanashi teach a system, where a fuel cell stack and reformer (although absent the hydrogen separator) is seen to be connected to a controller (fig. 1). Combining the fuel cell and vehicle control unit, which has vehicle speed sensor [25] would give the system the capability of performing the function as listed above. The motivation to combining the control system of Yamanashi with the combined system of Epp et al. and Meyer et al. is to more efficiently operate the fuel cell stack in tandem with the vehicle for easier and more efficient use. Therefore it would have been obvious to one having ordinary skill in the art at the time the claimed invention was made to combine the control system of Yamanashi with the combined system of Epp et al. and Meyer et al. in order to provide better usage of the fuel cell in combination with a motor vehicle.

As to claim 22, the previously obviated fuel cell/submarine combination of Epp et al. and the startup/shutdown process of Meyer et al. is applied. Meyer et al. teaches that during startup the fuel cell that the anode is initially purged (para 0027). This is

continued until the reformer [143] and the shift converter [136] (replaced with hydrogen separator) is approximately 250°C.

Meyer et al. does not, however, teach to purge the to purge the fuel processing system until the temperature at the reformer [134] shift converter [136] is 250°C. However, the motivation for purging the fuel processing system as well is to cleanse the system of any contaminants that could have gathered during the off time, so they would not be provided to the fuel cell once normal function of the fuel cell and fuel processor commenced. Furthermore, the flow of purge gases would aid in the warm-up process. Therefore it would have been obvious to one having ordinary skill in the art at the time the claimed invention was made to purge the fuel processor when the shift converter is at a lower temperature than the preset level in order to purify and to warm the system up.

Response to Arguments

10. Applicant's arguments filed August 20, 2007 have been fully considered but they are not persuasive.

Applicant argues that because Aoyama et al. does not disclose operations of the power system during shut downs that Aoyama does not disclose features that reasonably can be considered to correspond to the stop control module recited in claim 1.

Examiner respectfully disagrees. As presented in the rejection of claim 1, purge pump [74] and raw material valve [31] is connected to control unit [10] and thus is capable of running in the shut down mode claimed by the instant Application. With

respect to the functional limitations, Examiner again cites section 2114 in the MPEP as to the Office's policy or functional limitations to apparatus claims:

APPARATUS CLAIMS MUST BE STRUCTUR-ALLY DISTINGUISHABLE FROM THE PRIOR ART

>While features of an apparatus may be recited either structurally or functionally, claims< directed to >an< apparatus must be distinguished from the prior art in terms of structure rather than function. >*In re Schreiber*, 128 F.3d 1473, 1477-78, 44 USPQ2d 1429, 1431-32 (Fed. Cir. 1997) (The absence of a disclosure in a prior art reference relating to function did not defeat the Board's finding of anticipation of claimed apparatus because the limitations at issue were found to be inherent in the prior art reference); see also *In re Swinehart*, 439 F.2d 210, 212-13, 169 USPQ 226, 228-29 (CCPA 1971);< *In re Danly,* 263 F.2d 844, 847, 120 USPQ 528, 531 (CCPA 1959). "[A]pparatus claims cover what a device *is*, not what a device *does*." *Hewlett-Packard Co. v. Bausch & Lomb Inc.*, 909 F.2d 1464, 1469, 15 USPQ2d 1525, 1528 (Fed. Cir. 1990) (emphasis in original).

MANNER OF OPERATING THE DEVICE DOES NOT DIFFERENTIATE APPARATUS CLAIM FROM THE PRIOR ART

A claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural limitations of the claim. *Ex parte Masham,* 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987) (The preamble of claim 1 recited that the apparatus was "for mixing flowing developer material" and the body of the claim recited "means for mixing ..., said mixing means being stationary and completely submerged in the developer material". The claim was rejected over a reference which taught all the structural limitations of the claim for the intended use of mixing flowing developer. However, the mixer was only partially submerged in the developer material. The Board held that the amount of submersion is immaterial to the structure of the mixer and thus the claim was properly rejected.).

It is further noted that Applicant has not shown that the apparatus of Aoyama cannot operate in the same manner.

Applicant argues that because Aoyama teaches the use of purge gas in start-up and normal power system operations not for the removal of hydrogen from the hydrogen separation module that pump [74] does not operate a purge control system.

Examiner respectfully disagrees, as different uses for the same structure is merely functional language. Again, see MPEP section 2114 for the Office's policy on functional language for apparatus claims (as listed above). Applicant has not shown that the pump [74] cannot operate as a purge control to remove hydrogen from the hydrogen separation module.

Applicant argues that it is not identified which features in Aoyama et al. is capable of operating with the recited stop signal input module and stop control module.

Examiner respectfully disagrees and restates that "there is a purge system for the hydrogen separator, which is operated using pump [74]. Pump [74] is connected to a control unit [10]. The controller is also connected to raw material line via valve [31], and thus has the capability to receive a stop signal for supplying hydrogen to the fuel cell and to activate a purge mode to purge gas or a no-purge mode to merely stop the hydrogen flow." More specifically, the instant application relies on unit [50] of fig. 1 with a CPU as the control. This is similar to control unit [10] of Aoyama et al. (fig. 1; para 0036, lines 1-3). Again, Applicant has not shown how this system is structurally different than that of the instant application.

Applicant argues that Meyer et al.'s system does not inherently have a stop control module and is not capable of being programmed to stop with the no-purge mode in addition to the purge mode.

Examiner respectfully disagrees and would like to point to the 103 rejection made under Meyer et al. in view of Epp et al. as evidenced by Tillmetz et al. Examiner sets for the reasons for inherency for a stop input module and a stop control module since it

talks about a shut down system and the controlling of a switch [132], valves [141, 152, 154, 156], and blowers [116B, 116C]. It furthermore talks about diver valves [140, 149] being opened for purging both sides during the shutdown process. Although a stop input module and a stop control module is not positively stated, one would inherently exist in order to activate the shutdown mode and perform the operations, as set forth above. Additionally, it should be noted that switching to such a mode from a normal operation mode would inherently support stopping with an initial no-purge mode, as time lag would exist between stopping and the carrying out of the shutdown mode. Furthermore, different operational methods can be applied to the inherent controller, so that it operates in a different manner than set for above, specifically that it can initially stop with a no-purge mode, as claimed by the instant application.

With respect to the arguments with regards to the Epp et al. and Tillmetz et al., Applicant argues that the pieces do not cure the deficiencies of the primary reference (Meyer et al.). Applicant does not argue how the combination is improper. Therefore, the Examiner maintains the obviousness rejections and upholds the rejection of the primary reference, as above.

Conclusion

11. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not

mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Eugenia Wang whose telephone number is 571-272-4942. The examiner can normally be reached on 7 - 4:30 Mon. - Thurs., EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

EW

PATRICK JOSEPH RYAN
SUPERVISORY PATENT EXAMINER